Volume 6 Issue 2

Plankton News

The Newsletter of the Phytoplankton Monitoring Network

Investigating a Link between Domoic Acid and Whale Mortality

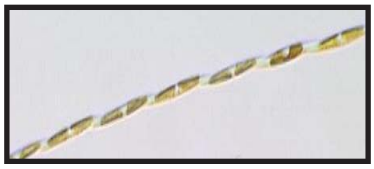
In November of 2006, a *Pseudo-nitzschia* bloom producing domoic acid (DA) was found by the volunteers at First Flight High School and the College of the Albemarle in North Carolina. This finding has led scientists to investigate whether there is a link between DA-producing *Pseudo-nitzschia* and whale mortalities along the Carolina Coast.

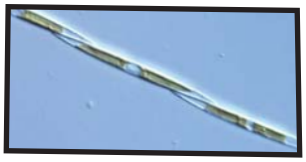
Whales can be exposed to *Pseudo-nitzschia* either through their diet or by direct ingestion. Scientists use samples of whale feces and urine to determine whether the whale is contaminated with DA. If levels of DA are abnormally high in fecal material, the sample is then prepared and observed using scanning electron microscopy (SEM) to determine the presence of *Pseudo-nitszchia*. Toxin accumulation in whales may be an indication of repeated exposures in remote areas not monitored for phytoplankton blooms, and may aid researchers in investigating routes of toxin transfer in the whales' food web.

On March 22, 2007, a pygmy sperm whale stranded near Beaufort, North Carolina. Low levels of DA were detected but it could not be confirmed that this was the cause of death. In April 2007, DA was found in a pygmy sperm whale carcass that stranded on the South Carolina coast. This current evidence of toxin exposure has initiated research into whether DA is present in archived whale specimens.

Dr. Spencer Fire, Coordinator for NOAA's Analytical Response Team, tested eighteen samples from whales collected between 1997 and 2007. Specimens tested were strandings from the coast of SC and include pygmy sperm whales, dwarf sperm whales and a beaked whale. DA concentrations were found in four of the whales with amounts ranging between 24 and 365ng/g. This result indicates some toxin exposure, but is not necessarily considered the cause of mortality. SEM analysis was performed by Dr. Steve Morton on fecal samples that were positive for DA, but *Pseudo-nitzschia* was not detected.

Detection of DA in whale specimens will promote further research into whether *Pseudo-nitzschia* blooms are a contributing factor to the death of marine mammals. Due to the persistence and hard work of PMN volunteer groups, scientists are able to discover more about the interconnectedness of our ocean ecosystems and the impact that phytoplankton derived biotoxins have on marine mammals.





Pseudo-nitzschia spp.

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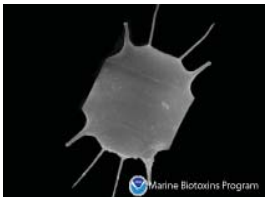
What is the Role of the Analytical Response Team?

The Analytical Response Team (ART) was established to provide assistance with toxin and species identification during harmful algal blooms and related health incidents. Accurate, timely information is required to make informed decisions involving shellfish harvest, life support for marine mammals, beach closures and remedial action. With expertise in toxicology, toxin chemistry, and algal taxonomy, ART is capable of identifying marine algal toxins and their involvement in unusual animal mortality events and human exposures. To find out more about ART, visit the Center for Coastal Environmental Health and Biomecular Research Website: http://www.chbr.noaa.gov/marinebiotoxins_art

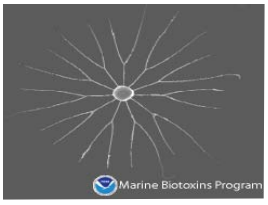
Mystery Plankton Contest



January

Answer: *Odontella* spp.

Congratulations to Amanda Leister of Myrtle Beach State Park!



February

Answer: *Bacteriastrum* spp.

Congratulations to Patrick Hutchins, a student at Coastal Carolina!

March - May

Answer: *Protoperidinium* spp.

Congratulations to Jennifer Garrish, a teacher at Ocracoke School!

June

Answer: *Corethron* spp.

Amanda Leister knows her phytoplankton! Congratulations!

PMN Snapshots

Dave Brandes (left) trying to stay dry while collecting a sample in a Texas Bay. Alabama volunteer, Val Dickerson (right) checking the salinity of the sample.

Liz Symon and Kimberly Nowocin work the PMN booth at the Maritime Festival in Charleston, SC.

Update from Dr. Morton

This has been an exciting spring and summer for the program. Since our last newsletter, we have expanded the network to include Texas and Alabama, therefore updating our name to the "Phytoplankton Monitoring Network". To all the new groups, welcome aboard!

As the 2007-2008 school year starts, we will be adding a new component to the network. This year we were able to order a new camera for the research microscope. Using this camera, you will be able to observe samples with us via the World Wide Web. More on NetCam when it is delivered.

On the research side, Liz Symon refers to this summer as the "Summer of *Pseudo-nitzschia*." Besides the activity on the Carolina coast (page 1 of this issue), we have been examining *Pseudo-nitzschia* and domoic acid from California and the Gulf of Mexico. We also collaborated with the University of South Carolina to examine samples collected from sediment traps and cores from the Santa Barbara basin to determine the historical record of *Pseudo-nitzschia* blooms from the early seventies until today. From our international collaborations, we were able to identify blooms of *Prorocentrum minimum* and *Trichodesmium erythraeum* from the Persian Gulf.

As we enter our seventh sampling year, I would like to thank you all again for all of your time and effort in this project. Who knows, the next new toxic bloom may be yours!

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Tel: 843-762-8656, Email: allison.sill@noaa.gov, Fax: 843-762-8700 or visit us on the web at: http://chbr.noaa.gov/pmn

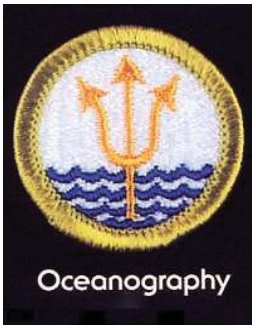
Welcome to New Staff

Liz Symon, SEM Technician and Culture Specialist

Liz Symon's experience and enthusiasm made her the perfect fit for the the Phytoplankton Monitoring Network. Liz attended the College of Charleston in Charleston, SC where she received a BS in Marine Biology. Liz's interest in phytoplankton developed her senior year while conducting a research study on phytoplankton species composition and distribution along two parallel transects from Folly Beach, SC along the continental shelf out to the Gulf Stream via funding through College of Charleston's Transects Program. It was during this program in which Liz was mentored by Dr. Steve Morton and introduced to the power of scanning electron microscopy (SEM). Liz decided after graduation she would pursue her interest in phytoplankton and harmful algal blooms (HABs) by working for the South Carolina Department of Natural Resources in the Algal Ecology Laboratory. There she served as an algal microscopist for two years. Now part of the Marine Biotoxins Program and the PMN, Liz enthusiastically serves as Dr. Morton's SEM and culture technician with ever increasing interest in morphology and taxonomy as well as composition and distribution.

Allison Sill, PMN Project Coordinator

The Phytoplankton Monitoring Network is excited to announce that Allison Sill has joined us as the new PMN Project Coordinator. Allison has over six years of experience in science education, both in traditional and non-traditional settings. Most recently, Allison taught 8th grade environmental science at Charlotte Country Day School, in Charlotte, North Carolina. Allison obtained her Masters Degree in Environmental Science from Antioch New England Graduate School and a BS in Biology from Wofford College. Before beginning her traditional teaching career, Allison worked as the Environmental Education Coordinator for the Bald Head Island Conservancy on Bald Head Island, NC. There she helped plan and implement coastal ecology programs for both residents and visitors to Bald Head Island. Allison also spent two years in South Carolina as the Loggerhead Sea Turtle Project Coordinator for the University of South Carolina's Center for Coastal Ecology, located on Pritchards Island. Here she helped monitor and inventory 200 nests and move eggs to hatcheries. Allison also provided groups with educational programs and coordinated night walks so that groups could see nesting loggerheads. Allison is excited about the real-world science opportunities that the PMN brings to citizens, teachers and students.

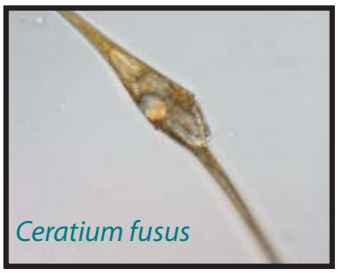


PMN and Boy Scouts of America

On July 18, ten Boy Scouts from Troop 332 in Union county, South Carolina, attended a PMN workshop to learn how to sample and identify phytoplankton. This workshop brought the scouts one step closer to obtaining a merit badge in Oceanography. Requirements that the scouts must meet include describing the place and importance of phytoplankton in the oceanic food chain, methods used by marine scientists to investigate organisms living in the ocean, and the importance of oceanography. Eight parents were also in attendance and actively involved in the discussion and identification. Good luck Troop 332!

Alabama joins the PMN

The University of Alabama is known as the Crimson Tide for good reason. Red tides often occur in the Gulf of Mexico, which makes the PMN expansion into Alabama very important in learning more about these harmful algal blooms. On July 6, thirteen participants representing nine sampling sites attended a training workshop at Dauphin Island Sea Lab (DISL). Groups represented were Weeks Bay (National Estuarine Research Reserve), Wolf Bay Watershed Watch, Gulf Island National Seashore, Little Lagoon Preservation Society and DISL. After an introduction to the program, the enthusiastic volunteers collected a sample off of the DISL pier and spent the afternoon learning how to identify phytoplankton. From *Bacillaria* to *Ceratium fusus*, the sample provided a great chance to see a diverse group of phytoplankton.



Ceratium fusus

For the past three months the Alabama volunteers have been hard at work , sampling and submitting data, and it is amazing to see the difference in numbers and types of species between the Atlantic Ocean and the Gulf of Mexico. *Pseudo-nitzschia* frequents the samples in high numbers. *Thalassionema* and *Chaetoceros* are also common inhabitants in Alabama's Gulf waters. No blooms yet, but there is no doubt that if one occurs this crew will find it!

Alabama plays a crucial role in helping us learn more about the distribution of phytoplankton species. The Gulf of Mexico is a new frontier for the PMN and we look forward to working together to monitor HABs.

Welcome to the network Alabama, roll tide roll!

Texas, Off and Running

The old Texas mentality of "Bigger is Better" certainly deals with the current state of the PMN in Texas. The coastline is big, "Gordon the Grouper" is big, and the number of people sampling in Texas is big! Just a few months after the initial May training workshops, over 30 sampling sites have been established along the Gulf coast. The initial workshops trained 43 participants, but since then an additional 21 people have received training.

The coastal chapters of the Texas Master Naturalists (TMN), along with Texas Parks and Wildlife, can lay a big claim to the initial success of the expansion of PMN into Texas. Over 80% of the sampling sites are monitored by TMN members. And TMN members have organized and conducted each of the additional training sessions since May. But the TMN members are not alone; they are joined by the Nature Conservancy, My Texas Water Foundation, Matagorda Bay Nature Park, and a host of other organizations.

The toxin-producing *Karenia brevis* 'red tide' is becoming a more common problem along the Texas coast. In 2005, the Texas Parks and Wildlife Department (TPWD) trained a volunteer group, called the Texas Red Tide Rangers, to collect water samples and identify *Karenia brevis* cells under a microscope. The Rangers collected and analyzed almost 376 samples during the '05 bloom, which lasted for 2 months. The PMN is hoping to build on the success of the Red Tide Rangers Program and expand the scope of public interest to include non-toxic phytoplankton monitoring. Volunteers to date have reported three non-harmful blooms that include: *Asterionella* spp., *Ceratium furca*, and *Chaetoceros* spp.

Great job! Welcome to the network Texas!

Volunteer Spotlight: Marcella Turonis, Oregon Inlet

Standing on the catwalk of the Oregon Inlet bridge on NC Highway 12 and lowering her plankton net over 50 feet into the fast-moving waters below is the typical sampling day for Marcella Turonis. Marcella monitors the salty water that flows between the Atlantic Ocean and the Pamlico Sound below the Herbert C. Bonner Bridge at the northern most edge of the Cape Hatteras National Seashore.

Marcella, a self-described "phyto-geek," is a marine science student at the College of the Albemarle (COA) and a Special Activities Instructor at the North Carolina Aquarium on Roanoke Island. It was back in 2005 that Dana Newton, her COA Oceanography professor, asked if anyone wanted to monitor phytoplankton. It sounded interesting, so Marcella volunteered and has stuck with it for the past two years, longer than the other students who started the program with her.

Each Monday, Marcella travels almost 20 miles in her "souped up" SUV to get to her sampling site. At the bridge she battles a strong current and blistery cold winds in the winter to collect her sample. Then on Tuesday she takes her sample into the COA science lab to be analyzed. It sometimes takes up to two and a half hours for her to count an entire slide.

It was during her normal sampling on November 6, 2006, that she noticed the water was turbid and that the sample had a yellow tint. She could see "stuff" in the bottle and remembers that it was "gross." What was it? It ended up being a toxin-producing, multi-species *Pseudo-nitzschia* bloom. Of course, she did not know that until the next day after looking at the sample under the scope. So when we asked her to collect shellfish, she made another trip out to the site, put on hip waders and braved the rocky shore and cold waters. "I love that I am able to participate in this program, especially after finding the toxic bloom in November. That made me realize how important it really is to keep tabs on what is in our water."

"I love looking at what is in the water I live by. It fascinates me. My friends used to think I was a dork, but when they heard about the toxic bloom they started to change their minds. People ask me all kinds of questions when I am on the bridge taking a sample. At first they think I am trying to catch minnows, but once I tell them I am fishing for much smaller critters they want to know more."

"I have taken samples to my son's school so the kids could see them and several of them told me they want to be marine biologists when they grow up. It is really cool to see the expressions on kids' faces when they look through a microscope and get to actually see all the microscopic 'sea monsters' they are swimming with. This program is very important to the safety of everyone in one way or another and it feels good to know that I am a part of it. I look forward to continuing to sample after I finish school. I just love being a part of this!" And all of us at the PMN enjoy having you as part of the network! We are glad that you have "always loved the ocean." Thanks, Marcella, for watching the waters of Oregon Inlet.

Q & A With a Marine Biologist
Jessica Tiedeken

School: Coastal Carolina University (2001)
Degree: BS Biology and Marine Science
Favorite Subject: Marine Biology
Best Part of Job: Conducting new research

Q: How did you become involved in marine science?
A: When I realized that I wanted to work with fish, I started volunteering in high school at an aquarium. I learned the basics of fish care and tank maintenance. With this experience and a degree in the sciences, I was able to get a position at the Virginia Institute of Marine Science (VIMS) working with algal toxins and fish exposures.

Q: What do you want to do next?
A: I am planning on attending grad school to obtain my masters. I haven't decided in what area, I have lots of interests. I went to work directly after my undergrad so that I could explore all of the different options out there. This is the first time in my life that I've not known specifically what I want to do.

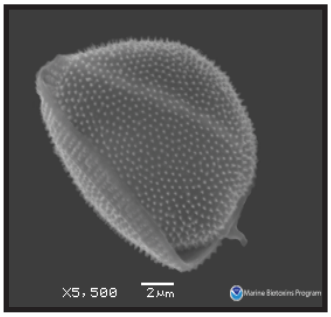
Current Research Areas:
Microinjection of domoic acid in zebrafish embryos to study resulting developmental conditions and behaviors.
Video of Study: http://www.chbr.noaa.gov/default.aspx?category=mb&pageName=tii4_video

Recent Publications:
Tiedeken JA, Ramsdell JS, Ramsdell AF. Development toxicity of domoic acid in zebrafish (*Danio rerio*). Neurotoxicol Teratol. 2005 Jul 29

Tiedeken JA, Ramsdell JS. Embryonic Exposure to Domoic Acid Increases the Susceptibility of Zebra Fish Larvae to the Chemical Convulsant Pentylenetetrazole. Environmental Health Perspectives. 2007 Aug 2.

Species Spotlight
Prorocentrum minimum

Prorocentrum minimum is a dinoflagellate that is widely distributed geographically around the world ranging from the east and west coasts of the United States to the coasts of Australia and the Mediterranean Sea. Often misidentified as *P. balticum*, *P. minimum* cells appear round to ovate in valve view with a length of 14-18 µm. The valve surface and marginal zone are covered with numerous fine spines along with intercalary striae containing several ridges perpendicular to the valve margin. In addition, it has a posteriorly located nucleus and anterior spine/spines. Morphological variability exists within this species due to its ability to respond and survive to ever-changing environmental conditions.



The toxicology and harmful effects of *P. minimum* are not definitively established. Although most consider the species relatively harmless to humans, past studies have found toxic strains in Japan and France that produced venerupin, a PSP-like toxin that attacks the liver. Larger blooms can have ecosystem effects such as oxygen depletion, pH change, and light attenuation that can cause death in marine invertebrates and seagrass. The expansion of *P. minimum* blooms, as with other increasing algal blooms around the world, is a possible result of increased aquaculture activities, eutrophication and transport in ship ballast waters. In addition, increased monitoring efforts have allowed scientists to become more observant and aware of what to look for in the earth's water systems.

Dr. Steve Morton with the Scanning Electron Microscope